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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/553,439	10/14/2005	Alberto Bianco	0508-1145	1423

466 7590 03/05/2009

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EXAMINER	
GREENE, IVAN A	
ART UNIT	PAPER NUMBER
1619	
MAIL DATE	DELIVERY MODE
03/05/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/553,439	BIANCO ET AL.	
	Examiner	Art Unit	
	IVAN GREENE	1619	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 October 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *27-52* is/are pending in the application.

4a) Of the above claim(s) *33-44 and 46-52* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *27-32 and 45* is/are rejected.

7)☒ Claim(s) *45* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 April 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *04/14/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Status of the claims

Claims 27-52 are currently pending. Claims 1-26 have been canceled by Applicant. Claims 33-44 and 46-52 have been withdrawn pursuant to a restriction requirement, as discussed below. Claims 27-32 and 45 are presented for examination on the merits.

Restriction

Applicant's election with traverse of group one, claims 27-32 and 45, in the reply filed on 12/01/2008 is acknowledged. The lack of unity of invention is traversed on two ground(s). Firstly that FISHER (US 6,203,814) does not describe the solubility of their nanoparticles in organic and/or aqueous solvent(s), and secondly that FISCHER does not disclose an intact carbon nanotube. This is not found persuasive because FISCHER teaches carboxylic acid surface functionalized nanotubes which would have the inherent property of solubility in organic solvents as described by Georgakilas et al., "solubilisation of NTs in organic solvents has been described in the literature, mainly based on the attachment of building blocks of carboxylic acids." (Chemical Communications, 2002, p. 3050, col. 1, lines 21-24). The argument that FISCHER does not disclose an intact carbon nanotube is not found persuasive because FISCHER discloses several routes for functionalization of the surface of the carbon nanotubes. Though, admittedly several routes involve strong acids which would be expected to produce defects on the surface of the carbon nanotubes, routes are give which would produce substantially intact functionalized carbon nanotubes. FISCHER et al. disclose

"additions to oxide free fibril surfaces" (col. 9, lines 36-67; col. 10, lines 1-40) wherein the carbon nanotubes are heated in a vacuum and subsequently surface functionalize by various routes.

The requirement is still deemed proper and is therefore made FINAL.

Claims 33-44 and 46-52 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected subject matter, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 12/01/2008.

It is noted that Applicant has not elected each species as required by the office action dated 09/29/08, however, in order to forward prosecution the requirement for species election is hereby removed.

Information Disclosure Statement

The information disclosure statement(s) submitted on 04/14/2005 was filed before the mailing date of the first office action on the merits. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the Examiner.

Priority

The U.S. effective filing date has been determined to be 04/14/2003, the filing date of the document PCT/EP03/03838. No claim of foreign priority has been made in the instant application.

Objections

The specification is objected for the use of improper scientific, the notation on page 4 lines 4, 7 and 24. The specification discloses, --n is an integer from about 3.10^3 to about 3.10^6-- (p. 4, line 4), and --there are from about 2.10^{-11} moles to about 2.10^{-9} moles of X functional groups-- (p. 4, lines 6 & 24). It is unclear what the value of the numbers "3.10^3", "3.10^6", "2.10^{-11}", and "2.10^{-9}" should be.

Claim 45 is objected to as being dependent on withdrawn claim 37. Applicant should correct the dependency of claim 45 to depended from a claim of the elected invention, or the claim should be amended to proper independent form.

Rejections

Claim Rejections - 35 U.S.C. 112 - First Paragraph

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

1. Claims 31 and 32 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. <u>This is a Written Description rejection</u>.

M.P.E.P. § 2163 states, "An applicant shows possession of the claimed invention by describing the claimed invention with all of its limitations using such descriptive means as words, structures, figures, diagrams, and formulas that fully set forth the claimed invention…one must define a compound by 'whatever characteristics sufficiently distinguish it'… A lack of adequate written description issue also arises if the knowledge and level of skill in the art would not permit one skilled in the art to immediately envisage the product claimed from the disclosed process."

Instant claim 31 recites, --effective group--, however no structure or formula is given for said effective group(s). The instant Specification provides the guidance as to what an effective group is:

--The expression "P is an effective group" means that P is a group which can confer new physical, chemical or biological properties to the carbon nanotube which carries it.--(p.10, last two lines; PG Pub [0063])

The specification offers guidance as to the "new physical, chemical or biological properties" by providing the examples which include linking a fluorescent molecule or an enzyme to the functional group attached to the surface of the carbon nanotube(s).

However, the Specification gives no further description of a what, specifically, the "new physical, chemical or biological properties" are. The skilled artisan cannot readily envision the chemical structure of the claimed "effective group(s)" which "can confer new physical, chemical or biological properties to the carbon nanotube which carries it." As such the instant claims cited above lack adequate written description of --effective group-- as recited in claim 31. Claim 32 depends from and does nothing to correct the indefiniteness of claim 31.

1. Claims 31 and 32 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Specifically the --effective group-- as recited in claim 31 lacks enablement as to how to make and use the claimed invention.

The factors to be considered in determining whether a disclosure meets the enablement requirement of 35 U.S.C. 112, first paragraph, have been described in *In re Wands*, 8 USPQ2d1400 (Fed. Cir. 1988). Among these factors are: 1) scope or breadth of the claims; 2) nature of the invention; 3) relative level of skill possessed by one of ordinary skill in the art; 4) state of, or the amount of knowledge in, the prior art; 5) level or degree of predictability, or a lack thereof, in the art; 6) amount of guidance or direction provided by the inventor; 7) presence or absence of working examples; and 8) quantity of experimentation required to make and use the claimed invention based upon the content of the supporting disclosure.

Scope or breadth of the claims

Applicant's claim a broad genus of surface functionalized carbon nanotube(s) where the functional group(s) attached to the surface of the carbon nanotube(s) which may comprise an effective group (P).

Nature of the Invention

Applicant's claimed invention relates to the field of nanostructured carbon materials, specifically surface functionalized carbon nanotubes. The invention is drawn to carbon nanotubes comprising surface functional group(s) wherein the group(s) are capping and/or protecting groups which may be replaced with another chemical group(s) by a relatively simple chemical reaction. The claimed invention therefore

provides carbon nanotube(s) which can be simply reacted to provide various surface functional groups at the preference of the skilled artisan.

Relative level of skill possessed by one of ordinary skill in the art

The level of skill in the art is high usually requiring a Masters degree or Doctorate to work in the field. Group leaders would be expected to have a Doctorate degree with several year of experience and an established expertise in the art.

State of, or the amount of knowledge in, the prior art

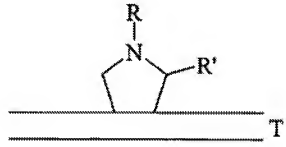
The amount of knowledge in the prior art is relatively low. While carbon nanotubes are well known in the chemical arts and the structure and properties of carbon nanotubes are well elucidated, the chemistry of surface functionalization is a relatively immature art. Georgkilas et al. teach, "only limited methods have been reported in the literature providing functionalized nanotubes with some solubility." (AIP Conf. Proc., 2002, vol. 633, pp. 73, lines 4-6). Seifert et al. teach, "It is well known that especially the open ends of CNTs are quite reactive due to the presence of dangling bonds and, therefore, may serve as regions for functionalization...By contrast, the functionalization of the sidewalls due to the aromatic-like bonding nature might be hard to realize, but would open avenues for modification of the intrinsic tube properties." (Applied Physics Letters, vol. 77, No. 9, pp. 1313, 1:7-13). Bahr et al. teach, "At first glance, judging from the number of reported reaction types…, the covalent chemistry of SWNTs is not particularly rich." (Journal of Materials Chemistry, 2002, vol. 12, p. 1952, 1:47-49).

Level or degree of predictability, or lack there of, in the art

The level of predictability in the art is relatively high. The art relies on the chemistry of materials with regards to the carbon nanotubes and the chemical arts with regards to surface functionalization of the carbon nanotubes. The predictability of each of these field is relatively high. With regards to medical applications of functionalized carbon nanotubes the degree of predictability is low, however, as the interaction of such nanostructures with biological systems is not well understood.

Amount of guidance or direction provided by the inventor

The inventor provides guidance on the surfaces functionalization of carbon nanotubes. The surface functionalization begins with 1,3-dipolar addition of azomethine ylides resulting in a pyrrolidine ring attached to the surface of the carbon nanotube:



The inventor further provides various chemical groups which could be substituted in the R and/or R' positions of the pyrrolidone ring surface group. The guidance provided by the inventor is not commensurate in scope with the broad genus of the claimed invention.

Presence or absence of working examples

The inventors provide 10 working examples resulting in 11 unique functionalized carbon nanotube compositions. However, 8 of the 11 unique functionalize carbon nanotube compositions are derived from further functionalization of one of the other functionalized carbon nanotubes. Furthermore each of the working examples relies on the 1,3-dipolar addition of azomethine ylide reaction as a starting point, which is not commensurate in scope with at least the first 5 claims of the instantly claimed invention.

Quantity of experimentation required to make and use the invention

The quantity of experimentation required to make and use the invention, as claimed is undue because the state of knowledge in the prior art is relatively low and the guidance and working examples provided by the inventors in the specification is not commensurate in scope with the instantly claimed invention. Therefore the skilled artisan would be burdened with undue experimentation when tasked with finding the --effective group(s)-- of the instantly claimed invention.

In conclusion, claims 31 and 32 are rejected in light of the relatively low amount of knowledge in the prior art and, the limited guidance and/or working examples provided by the inventors in the specification.

Claim Rejections - 35 U.S.C. 112 - Second Paragraph

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

1. Claims 29-32 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

2. Claims 29-32 are rejected for reciting improper Markush language. Claim 29 recites --selected form a group comprising-- (lines 2-3); claim 31 recites --selected from the list comprising-- (lines 10, 12-13 & 16); claim 32 recites --selected from the list comprising-- (lines 2-3). Claims 29, 31 and 32 require the addition of the word/phrase "selected from the group consisting of". See MPEP § 2173.05(h) for more information. Claim 30 is rejected because it depends from and does nothing to correct the indefiniteness of claim 29.

3. Claims 30-32 recites, --n is an integer from about 3.10^3 to about 3.10^6-- and -- there are from about 2.10^{-11} moles to about 2.10^{-9} moles of X functional groups-- (p. 3, lines 4-6). It is unclear what the value of the numbers "3.10^3", "3.10^6", "2.10^{-11}", and "2.10^{-9}" should be. Claims 31-32 are rejected because they depend from and do nothing to correct the indefiniteness of the parent claim(s).

4. Claims 31 and 32 are rejected for being indefinite because claim 31 recites --effective group--. The instant specification discloses, "The expression "P is an effective group" means that P is a group which can confer new physical, chemical or biological properties to the carbon nanotube which carries it." It is unclear what exactly the metes and bounds of effective groups are. Claim 32 is rejected because it depends from and does nothing to correct the indefiniteness of claim 31.

5. Claims 31 and 32 are rejected as being indefinite because claim 31 recites "derived from a reactive group." The instant specification discloses, "The expression 'Y is derived from a reactive group' means that Y is a heteroatom or a functional group which has been modified by a chemical reaction generating a new covalent bond." (p. 7, lines 11-13). It is unclear what exactly the metes and bounds of "derived from a reactive group" are. Claim 32 is rejected because it depends from and does nothing to correct the indefiniteness of claim 31.

6. Claims 31and 32 are rejected as being indefinite because claim 31 recites "liable to be linked to." The instant specification does not define "liable to be linked to" and it is unclear what the metes and bound of this expression should be. Claim 32 is rejected because it depends from and does nothing to correct the indefiniteness of claim 31.

7. Further regarding claims 31 and 32, the phrase "such as" renders the claim indefinite because it is unclear whether the limitations following the phrase are part of the claimed invention. See MPEP § 2173.05(d).

8. Further regarding claims 31 and 32, the phrase "in particular" renders the claim indefinite because it is unclear whether the limitations following the phrase are part of the claimed invention. See MPEP § 2173.05(d).

Claim Rejections - 35 U.S.C. 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

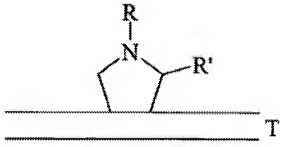
(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 27-32 and 45 are rejected under 35 U.S.C. 102(a) as being anticipated by Georgakilas et al. (Chemical Communications, 2002, pp. 3050 - 3051).

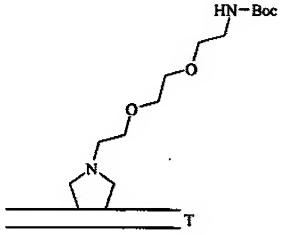
Applicant claims

Applicant claims a functionalized carbon nanotube, the surface of which carries covalently bound reactive and/or activable functional groups which are homogenously distributed on said surface, said functionalized carbon nanotube being substantially intact and soluble in organic and/or aqueous solvents. Applicant further claims the functionalized carbon nanotube wherein the carbon nanotube is a single-walled (SWNT) or multi-walled (MWNT) carbon nanotube. Applicant further claims a functionalized carbon nanotube wherein organic solvents are selected from dimethylformamide, dichloromethane, chloroform, acetonitrile, dimethylsulfoxide, methanol, ethanol, toluene, isopropanol, 1,2-dichloroethane, N-methylpyrrolidone, or tetrahydrofuran. Applicant further claims the functionalized carbon nanotube of the general formula $[C_n]$-X_m wherein C_n are carbons of a substantially cylindrical carbon nanotube of substantially constant diameter and X represents one of several functional groups. Applicant further claims various functional groups attached to the surface of carbon the claimed carbon nanotubes via substituted pyrrolidine rings:



where (T) represents the carbon nanotube.

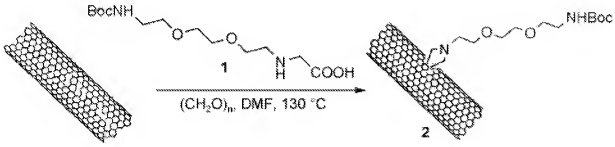
Applicant further claims the species:



in claim 32.

Disclosure of the Prior Art

Georgakilas et al. disclose the solubilisation in aqueous media of side-wall chemically modified, full length SWNTs and MWNTs and their derivitisation with N-protected amino acids (p. 3050, col. 1, lines 39-41). Georgakilas et al. further disclose the chemically functionalized carbon nanotube:



which is dissolved in dimethylformamide (DMF) (p. 3050, col. 2, Scheme 1).

2. Claims 27-32 and 45 are rejected under 35 U.S.C. 102(b) as being anticipated by Georgakilas et al. (Journal of the American Chemical Society, vol. 124, No. 5, pp. 760-761).

Applicant claims

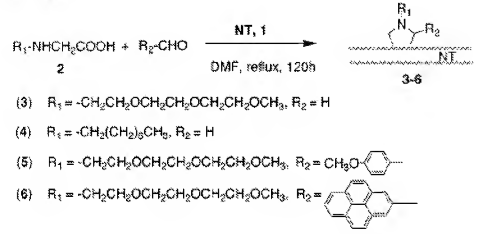
Applicant claims a functionalized carbon nanotube, the surface of which carries covalently bound reactive and/or activable functional groups which are homogenously distributed on said surface, as discussed above.

Disclosure of the Prior Art

Georgakilas et al. disclose their approach to carbon nanotube functionalization, which works for SWNTs and MWNTs, has lead to a high level of solubility of the resulting products (p. 760, 1:13-17). Georgakilas et al. further disclose, their functionalization methodology is based on 1,3-dipolar cycloaddition of azomethine ylides, generated by condensation of an α-amino acid and an aldehyde (p. 760, 1:26-28). Georgakilas et al. further disclose the SWNTs were suspended in DMF, together with excess aldehyde and modified glycine...the heterogenous reaction mixture was heated to 130 C for 5 days...giving a brown solid which was very soluble in $CHCl_3$,

CH_2Cl_2, acetone, methanol, ethanol, and also water (p. 760, 1:30-36). Georgakilas et al. further disclose the reaction products of scheme 1:

Scheme 1



Which reads on the claimed genus where, M is $-(CH_2)_r$ or $-(CH_2\text{-}CH_2\text{-}O)_r\text{-}CH_2CH_2$- , and Y is a reactive group when a=b=0 or at least one of Y, Z, or P groups, can be substituted by a capping group. Georgakilas et al. further disclose their results were successful with the use of either short oxidized or long nonoxidized SWNTs without notable differences in their solubility and yields of between 20 and 80% (p. 761, 1:15-17).

Double Patenting

A rejection based on double patenting of the "same invention" type finds its support in the language of 35 U.S.C. 101 which states that "whoever invents or discovers any new and useful process ... may obtain a patent therefor ..." (Emphasis added). Thus, the term "same invention," in this context, means an invention drawn to identical subject matter. See *Miller v. Eagle Mfg. Co.*, 151 U.S. 186 (1894); *In re Ockert*, 245 F.2d 467, 114 USPQ 330 (CCPA 1957); and *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970).

A statutory type (35 U.S.C. 101) double patenting rejection can be overcome by canceling or amending the conflicting claims so they are no longer coextensive in scope. The filing of a terminal disclaimer cannot overcome a double patenting rejection based upon 35 U.S.C. 101.

1. Claims 27-29 and 45 provisionally rejected under 35 U.S.C. 101 as claiming the same invention as that of claims 1-3 and 25 of copending Application No. 11/249,328. This is a provisional double patenting rejection since the conflicting claims have not in fact been patented.

2. Claims 27-29 and 45 of this application conflict with claims 1-3 and 25 of Application No. 11/249,328. 37 CFR 1.78(b) provides that when two or more applications filed by the same applicant contain conflicting claims, elimination of such claims from all but one application may be required in the absence of good and sufficient reason for their retention during pendency in more than one application. Applicant is required to either cancel the conflicting claims from all but one application or maintain a clear line of demarcation between the applications. See MPEP § 822.

Nonstatutory Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

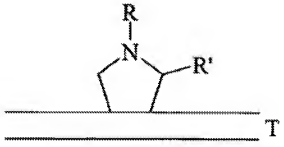
A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

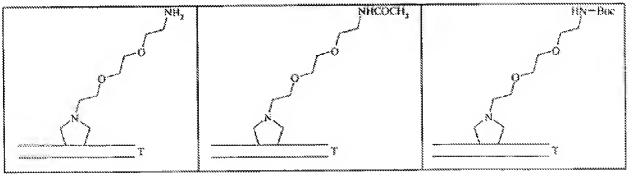
1. **Claims 30-32 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 4, 7 and 9 of copending Application No. 11/249,328 (hereafter '328).**

Although the conflicting claims are not identical, they are not patentably distinct from each other because the copending claims are substantially coextensive in scope with the instant rejected claims.

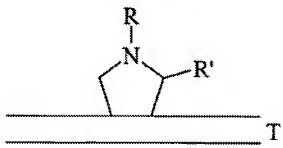
Instant claim 30 recites, a functionalized carbon nanotube according to claim 3, of the following general formula $[C_n]$-X_m wherein C_n are surface carbons of a substantially cylindrical carbon nanotube of substantially constant diameter, said diameter being from about 0.5 to about 50 nm, in particular from about 0.5 to 5 nm for SWNTs and from about 20 to about 50 nm for MWNTs, X is a functional group, identical, n is an integer from about 3.10^3 to about 3.10^6, m is an integer from about 0.001n to about 0.1n, there are from about 2.10^{-11} moles to about 2.10^{-9} moles of X functional groups per cm^2 of carbon nanotube surface. Instant claim 31 recites, a functionalized carbon nanotube according to claim 4, wherein X represents one or several substituted pyrrolidine rings, identical or different, of the following general formula (I):



wherein T represents a carbon nanotube, and independently from each other R and R' represent -H or a group of formula -M-Y-$(Z)_a$-$(P)_b$, wherein a represents 0 or 1 and b represents an integer from 0 to 8, preferably 0, 1, or 2, P representing identical or different groups when b is greater than 1, provided R and R' Cannot simultaneously represent H. The variables of M, Y, Z and P are substantially coextensive in scope, the difference being that in the instant claim more species structures are claimed for the Z group. Instant claim 32 recites, a functionalized carbon nanotube according to claim 31, wherein a=b=0 and Y is a reactive group selected from the list comprising -OH, -NHE, -COOH, -SH, -CHO, a ketone, such as -COCH3, an azide, or a halide, in particular -NH2, said functionalized carbon nanotube being, if appropriate, substituted by a capping or a protecting group, in particular a Bz, Boc or acetyl group, and being for instance a functionalized carbon nanotube of one of the following formulae:

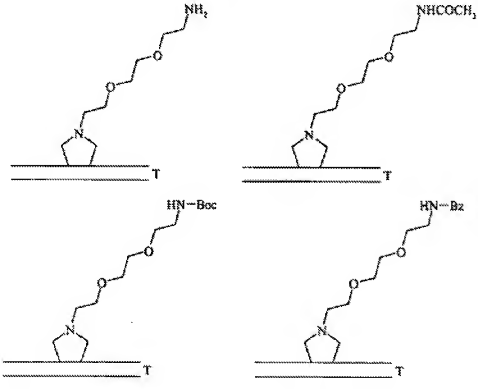


Copending '328 claim 4 recites, a functionalized carbon nanotube according to claim 3, of the following general formula $[C_n]$-X_m wherein C_n are surface carbons of a substantially cylindrical carbon nanotube of substantially constant diameter, said diameter being from about 0.5 to about 50 nm, in particular from about 0.5 to 5 nm for SWNTs and from about 20 to about 50 nm for MWNTs, X represents one of several functional groups, identical or different, each functional group comprising at least one effective group, n is an integer from about 3.10^3 to about 3.10^6, m is an integer from about 0.001n to about 0.1n, there are from about 2.10^{-11} moles to about 2.10^{-9} moles of X functional groups per cm^2 of carbon nanotube surface. Copending '328 claim 7 recites, a functionalized carbon nanotube according to claim 4, wherein X represents one or several substituted pyrrolidine rings, identical or different, of the following general formula (I):



wherein T represents a carbon nanotube, and independently from each other R and R' represent -H or a group of formula -M-Y-$(Z)_a$-$(P)_b$, wherein a represents 0 or 1 and b represents an integer from 0 to 8, preferably 0, 1, or 2, P representing identical or different groups when b is greater than 1, provided R and R' Cannot simultaneously represent H. The variables of M, Y, Z and P are substantially coextensive in scope, the

difference being that in the instant claim more species structures are claimed for the Z group. Copending '328 claim 9 recites, a functionalized carbon nanotube according to claim 7, wherein a=b=0 and Y is a reactive group selected from the list comprising -OH, -NHE, -COOH, -SH, -CHO, a ketone, such as -COCH3, an azide, or a halide, in particular -NH2, said functionalized carbon nanotube being, if appropriate, substituted by a capping or a protecting group, in particular a Bz, Boc or acetyl group, and being for instance a functionalized carbon nanotube of one of the following formulae:



The difference between the rejected claims and the claims of copending '328 is that copending claim 4 has the limitation that each X can be identical or different.

It would have been obvious to one of ordinary skill in the art at the time the claimed invention was made that the instant claims are an obvious variant of the claims of copending '328 because the skilled artisan would recognize and have a reasonable

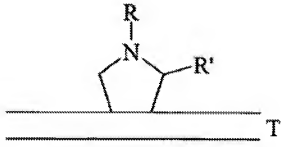
expectation of success that each X could be the same or different, especially in the absence of evidence to the contrary.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

2. Claims 30 and 31 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 34 and 36 of copending Application No. 11/628,749 (hereafter '749).

Although the conflicting claims are not identical, they are not patentably distinct from each other because the copending claims are substantially coextensive in scope with the instant rejected claims.

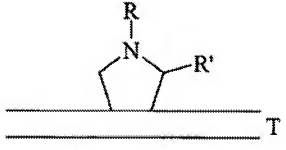
Instant claim 30 recites a functionalized carbon nanotube according to claim 3, of the following general formula $[C_n]$-X_m wherein C_n are surface carbons of a substantially cylindrical carbon nanotube of substantially constant diameter, said diameter being from about 0.5 to about 50 nm, in particular from about 0.5 to 5 nm for SWNTs and from about 20 to about 50 nm for MWNTs, X is a functional group, n is an integer from about 3.10^3 to about 3.10^6, m is an integer from about 0.001n to about 0.1n, there are from about 2.10^{-11} moles to about 2.10^{-9} moles of X functional groups per cm^2 of carbon nanotube surface. Instant claim 31 recites, a functionalized carbon nanotube according to claim 30, wherein X is a pyrrolidine ring, of the following general formula (I):



wherein T represents a carbon nanotube, and independently from each other R and R' represent -H or a group of formula -M-Y-$(Z)_a$-$(P)_b$, wherein independently from each other (a) and (b) represent 0 or 1, provided R and R' Cannot simultaneously represent H. The variables of M, Y, Z and P are substantially coextensive in scope, the difference being that in the instant claim more species structures are claimed for the Z group.

Copending '749 claim 26 recites, a complex comprising a carbon nanotube comprising positive or negative charges, said charges being carried by at least one charge-carrying group, said charge-carrying group being covalently bound to the surface of said carbon nanotube, and at least one charged molecule, said charged molecule comprising at least one negative charge if said carbon nanotube comprises positive charges or at least one positive charge if said carbon nanotube comprises negative charges, provided that the charged molecule is different from Cl- and TFA-, the bond between the carbon nanotube and the charged molecule being essentially electrostatic. Copending claim 34 recites, the complex according to claim 26, wherein the carbon nanotube corresponds to the following general formula $[C_n]$-X_m wherein C_n are surface carbons of a substantially cylindrical carbon nanotube of substantially constant diameter, said diameter being from about 0.5 to about 50 nm, for SWNT and

from 20 to about 50 nm for MWNT, X represents one of several functional groups, identical or different, provided that at least one of the X groups comprises at least one charge carrying group, n is an integer from 3×10^3 to 3×10^6, m is an integer from 0.001n to 0.1n, there are from 2×10^{-11} moles to 2×10^{-9} moles of X functional groups per cm^2 of carbon nanotube surface. Copending claim 36 recites, the complex according to claim 34, wherein X represents one or several substituted pyrrolidine rings, identical or different, provided that at least one of said substituted pyrrolidine rings is substituted by at least one charge-carrying group, of the following general formula (I) :



wherein T represents a carbon nanotube, and independently from each other R and R' represent -H or a group of formula $-M-Y-(Z)_a-(P)_b$, wherein (a) represents 0 or 1 and (b) represents an integer from 0 to 8, preferably 0, 1, or 2, P representing identical or different groups when b is greater than 1, provided R and R' cannot simultaneously represent H. The variables of M, Y, Z and P are substantially coextensive in scope, the difference being that copending claim 36 includes the limitation that said group optionally include charged group(s).

The difference between the rejected claims and the claims of copending '749 is that the claim of '749 include a charge carrying group.

It would have been obvious to one of ordinary skill in the art at the time the claimed invention was made that the instant claims are an obvious variant of the claims of copending '749 because the skilled artisan would recognize and have a reasonable expectation of success that X could be a charge carrying group. The skilled artisan would have been motivate to prepare the salt of the functionalized carbon nanotube in order to increase the aqueous solubility and may increase the storage stability.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Conclusion

Claims 27-52 are currently pending. Claims 33-44 and 46-52 have been withdrawn pursuant to a restriction requirement. Claims 27-32 and 45 have been presented for examination on the merits. The specification is objected; claim 45 is objected; claims 31 and 32 are rejected under U.S.C 112 first paragraph based on written description and enablement requirements; claims 29-32 are rejected under U.S.C. 112 second paragraph; claims 27-32 and 45 are rejected under U.S.C. 102(a) and U.S.C. 102(b); claims 27-29 and 45 are provisionally rejected for statutory double patenting over copending 11/249,328. Claim(s) are rejected on the ground of nonstatutory double patenting over copending applications 11/249,328 and 11/628,749.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to IVAN GREENE whose telephone number is (571)270-

5868. The examiner can normally be reached on Monday through Thursday 7AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Johann Richter can be reached on (571) 272-0646. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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IVAN GREENE
Examiner, Art Unit 1619

/Johann R. Richter/
Supervisory Patent Examiner, Art Unit 1616